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ORIGINAL ARTICLES.

BLOOD IN THE URINE—HOW TO DISCOVER ITS
SOURCE AND WHAT TO DO FOR IT. 1

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At the outset of this discussion I assume that the term "blood in the urine" refers to the presence in the urine of normal or intact blood-disks, and that no reference is to be made to that pathological condition known as hæmoglobinuria or hæmatinuria. This condition, in which the corpuscles become dissolved in the blood, the hæmoglobin thus set free being excreted by the kidneys, is occasionally met with, but belongs to medical practice (strictly speaking) and is not pertinent to our subject. It must also be premised that blood in the urine is but one symptom, and may occur in many different pathological conditions. It is usually associated with other symptoms, but its mere presence is not diagnostic of any particular lesion, nor do its characteristics determine definitely from which part of the genito-urinary tract it exudes. It is true that it is often the first symptom for which treatment is sought, and although it may be the most dangerous, it is not necessarily the most diagnostic one. We must still remember that although the hæmaturia may be the most prominent symptom, it is but one of a group. The blood in the urine is but one of the factors in the diagnosis of its cause. In quantity it may vary from a few drops to a very great volume, enough to jeopardize the life of the subject, and it may be persistent, continuously present, or intermittent. When intermittent, the intervals may be from a few days to several years. In my opinion, neither its color nor its quantity will enable us to decide definitely whence it comes. Writers have declared that when the blood in the urine is bright red in color it indicated hemorrhage from the bladder; and when it was blackish or deeply intermingled with the urine, it indicated renal hemorrhage. But in my observation the color alone does not indicate its source, for in some lesions of the bladder we often have blood which is thoroughly intermingled with the urine, and the latter may be as black or deep in color as the urine which comes from the kidney. And on the other hand, I have seen bright red blood sufficient in quantity to coagulate in the bladder, come from the kidney.

1 Read before the Section on Genito-Urinary Surgery of the New York Academy of Medicine, October 13, 1892.



Blood may find its way into the urine from any of the anatomical divisions of the genito-urinary tract, or from one or more of these divisions at the same time. I believe, from my own observation, that blood in the urine from a source in the urethra may be overlooked. It is not sufficient to say that a "urethrorrhagia," whether from a traumatism or otherwise, is diagnostic in itself, for I have seen a sequel of gonorrhœ in the urethra permit blood to exude which escaped only with urination; nor is it enough to say that blood from the urethra will find its way out in the intervals of urination, and has no relation to the act. Blood can escape from this canal during the act of urination. The physiological action of the urethra may cause blood to escape from a diseased area sufficient in quantity to be commingled with the urine as the latter passes. and there be no appearance of it at any other time. The history of antecedent or present urethritis, and the absence of bladder or kidney symptoms, together with the fact that the blood is comparatively minute in quantity relative to the amount of urine, will lead us to suspect the urethra as the source of the hemorrhage, but the endoscopic tube will make the diagnosis definite. Just here permit me to suggest two cautions which may seem trite and puerile to you, but as I have seen it necessary to eliminate this troublesome symptom, I will remind you that sometimes the tube, when introduced into an inflamed urethra, especially if it be made to enter the membranous or prostatic portions, may press blood out from a hyperæmic locality. Also it must be remembered that in some individuals a granular or subacute urethritis in the bulbous portion of the urethra will so irritate as to cause the frequent and urgent calls to urinate which we are apt to associate with lesions of the posterior urethra or neck of the bladder. Without the use of the tube in such a case we might be led to consider the bladder as the source of the hemorrhage. I think I can appeal to your experience that this has at times puzzled you and obscured your diagnosis. Of course, the treatment of the diseased urethra will in such cases cure the hemorrhage. The diagnosis of hemorrhage from the urethra, in any of its parts. due to traumatism, surgical or otherwise, is determined by its cause and in its treatment is subject to ordinary surgical principles.

That the ureters may furnish blood for admixture with the urine as it traverses these canals there can be no doubt, as anyone who has ever witnessed the effect of an impacted calculus will admit; but as the pathological conditions of the ureters are so infrequent and so obscure, I will limit my part of the discussion to the differential diagnosis between bladder and renal hemorrhage.

The answer to the question as to whether the source of the hemorrhage is in the bladder or kidneys is often a very troublesome one. It introduces points of great complexity, and some-

times, indeed, the hemorrhage may be found to be from both the bladder and the kidney. We may say, in general, that hemorrhage from the bladder is much more abundant, more likely to clot, more persistent, and, when intermittent, with shorter intervals than that from the kidney. It is usually associated with some symptom of irritability or inflammation of the bladder, and also with some evidence of a lesion, ascertained by an exploring instrument or by bimanual palpation. The exploring instrument may detect enlargements of or projections from the prostate; it may detect but not definitely determine, the presence of growths from the walls of the bladder, and it may detect the presence of stone or foreign bodies, but minute granulomata, soft papillomata, tubercular ulcers—all of which I have seen in my experience cause free hemorrhage—may entirely elude any instrument guided by the sense of touch. Fortunately, we are now able to bring to our aid another sense. With the cystoscope we are able to see the lesions, and make a differential diagnosis, and are able also to determine whether the blood comes from the bladder, kidney or kidneys. But cases will occur in which we can get no help from the latter instrument, or in which it may be necessary to supplement the evidence furnished by it. We sometimes have cases of insidious disease of the bladder which give no objective symptoms other than abundant and dangerous hemorrhage. I have had a case of (recurrent) papilloma of the bladder in which there was absolutely no symptom until the occurrence of repeated and prostrating hemorrhages. Furthermore the hemorrhage was so abundant, and the blood was so rapidly and deeply intermingled with the urine, that the cystoscope gave no aid in the diagnosis. In this case the diagnosis was made, first, by determining the fact with the searcher that a foreign body was present upon the right side of the bladder; secondly, that the exploration of the bladder with the searcher increased the hemorrhage and thirdly, when the bladder was emptied with the catheter and the last portion of its contents allowed to drain into a separate glass, this was noted to be redder in color and to contain more blood than the other portion of the fluid. The bladder was then washed repeatedly with an antiseptic solution, and at no time did the fluid return from the bladder without being tinged with blood. Each time, as the bladder emptied itself, it seemed to drain blood from the neoplasm directly into the catheter, and the last portion of the fluid was always darker than the first. In this case, the incision into the bladder and the removal of the tumor by the supra-pubic route of course instantly stopped the hemorrhage.

It has been my experience with the cystoscope, which, in spite of its occasional failures, should be regarded as an instrument of precision, to observe that hemorrhage from the kidney is rarely so rapid and abundant as to obscure the fluid medium

in the bladder. Hence, if this does take place, in a given case, it may be regarded as one of the diagnostic points in favor of the lesion being in the bladder. But if the case which is presented for diagnosis has no symptom of disease of the bladder other than the hæmaturia, it will not do to assume that therefore the blood comes from the kidney. There can be no question that the latter—one or both of them—may supply an enormous quantity of blood, and sometimes without any particular effect upon the general well-being of the subject. Physiological and pathological facts both demonstrate this, but inasmuch as the question of treatment of the symptom involves the removal of the cause, we should carefully, studiously, and in order examine each of the organs from which the blood may come. Associated symptoms give valuable aid in determining the source of the hemorrhage to be in the kidney, and when obscure, or not present at the time of the examination, must be carefully sought for.

Lumbar pain, associated with blood in the urine, is a frequent accompaniment of lesions of the kidney. It may be only vaguely like the intensely severe colic which accompanies the passage of a renal calculus, but, especially if it be unilateral and minute clots be found in the urine, it is plainly valuable in locating the lesion. Manual exploration may also reveal in the kidney region the presence of a distinct enlargement or of an indefinite fullness, or of mere tenderness, but I will admit that these signs are not always present, and are not easily ascertained. Individuals vary so in the amount of adipose tissue about the kidney that no positive conclusion either way (for or against) can be drawn from the two latter symptoms alone, and it is only as one or both form part of a group that they are valuable. It should be stated here that a movable or floatinikidney may be the cause of blood in the urine, and its investigation should not be omitted in a doubtful case. The microscopic examination of the urine which, "it goes without saying," is a matter of course in all genito-urinary cases, gives especially valuable aid in suspected kidney lesions by informing us of the presence of casts, crystalline and granular material, tissue of neoplasms, and epithelium. Important differential evidence is furnished by the "catheterism en deux temps," suggested, I believe, by Guyon, with which I suppose all surgeons are familiar, and to which reference has already been made. The fallacy in it, against which we must carefully guard, is that blood may trickle into the bladder from the ureters, coagulate, and be delivered at the end of the catheterization, stimulating the bleeding from a vesical neoplasm. I have been led to multiply the washings, and to add the device of pressure over each kidney and ureter in turn between the washings. Thus: The catheter is passed, and the last portion of urine gathered in a separate glass. The color and characteristics of this small

quantity are noted, and the glass numbered and set aside for microscopic examination. The bladder is then thoroughly washed, emptied, and the last few drops of the fluid separated in another glass. The bladder is again washed, emptied, and the catheter allowed to remain a few moments, while deep, bimanual pressure is made over (for example) the right kidney and along the course of the right ureter. The fluid, which escapes slowly, and often only in drops, is also gathered in a separate glass, and set apart for microscopic examination. The bladder is again washed, and the manœuvre repeated with the left kidney and ureter. If the small amount of fluid which is gathered under these circumstances is tinged with blood, the strong probability is that it comes from the kidney, and subsequent microscopic examination of the fluid may convert this probability into certainty. This procedure may not be unfamiliar to you, but I was led to employ it by observing in two cases of pyelo-nephrosis that, after thoroughly washing the bladder, purulent fluid could be made to spurt from the catheter (*in situ*) by pressure over the diseased kidney. I may add that one of these individuals learned the art of emptying his kidney (so to speak) and gained so in well-being that he positively refused operation. The following somewhat complex case illustrates some of the points, and I beg leave to quote it briefly.

A gentleman, aged forty-six; intermittent attacks of hæmaturia in eight years, lasting a few days at a time. For the past three weeks profuse and persistent hemorrhage. He noticed that the first gush of urine contained bright red blood, and then the stream grew darker, and finally became a deep smoky color. No frequency of urination; no pain associated with the act of urination; no lumbar pain; no lumbar enlargements or tenderness. History of urethritis and subsequent attacks of frequent and painful urination. General condition was depreciating. Confinement to the house, and the taking of ergot, etc., made him complain of feeling wretched. Locomotion did not increase the amount of blood, nor cause pain. The introduction of a soft catheter was attended with some difficulty in the posterior urethra, and as it entered the neck of the bladder he complained greatly of pain, and immediately there was a gush of bright red, clotted blood, followed by very dark-colored smoky urine. I thought at first that I had to deal with a neoplasm at the neck of the bladder, especially as per rectum there was a tenderness and a sense of fulness in this region. The washings, as detailed above, were then undertaken, and the drainings of each few moments were always tinged with blood. Microscopic examination of his urine showed free blood, a small amount of pus and epithelium; and of the drainings, free blood and a cast. Treatment of the posterior urethritis, to which the pus could be referred, relieved the pain and difficulty of introducing instruments, and exploration with the cystoscope (more than

once) showed a normal bladder and bright red blood exuding from the left ureter. This was evidently in sufficient quantity to coagulate at the base of the bladder and be expelled with the first contraction of the viscus. The presence of a normal bladder, and the absence of signs of abscess, neoplasm (including tuberculosis), or calculus in the kidney or its plexus, which at the end of eight years ought to be manifesting themselves, led me to consider the cause of this man's hemorrhage as congestion, due possibly to some form of toxæmia. The examination of blood taken from his finger revealed the presence of "*plasmodium malarie*" in abundance. All instrumentation was stopped and his hemorrhage ceased abruptly under the administration of tincture of hamamelis, followed by quinine.

Of course, cases might be multiplied which would indicate the difficulties of diagnosis, but these are familiar to you, and would only be a waste of time to attract your attention to them.

The second part of the question, namely, "What shall we do for blood in the urine?" is so directly connected with the treatment of its cause that we are immediately led to ascertain upon what pathological condition in the genito-urinary tract its presence depends. Here it must be said that in the time allotted it would be impossible to present these in detail, nor would it be practical, for I think our minds may be led to valuable results by considering the subject in a general way. The question involves often the treatment of the symptoms as well as the removal of its cause.

The comparatively small amount of blood which escapes with the urine during an attack of gonorrhœal cystitis is, as a symptom, of little consequence, and it is only necessary to say to you that the treatment of the cystitis itself will cure the hæmaturia. But in the old man, with prostatic hypertrophy, who is bleeding profusely into his own bladder, the latter, perhaps, distended with clots and urine and making the most agonizing and violent contractions to expel its contents, the condition is entirely different. Here the shock of the loss of blood is added to by the violence of the suffering, and the question as to what shall be done is an exceedingly delicate one. Sometimes the very act of relieving a retention, and thus putting the bladder at rest, will stop the hemorrhage. Sometimes again, the quieting of the expulsive effort of the bladder by the use of opium (morphia), relieves the congestion (because, as you remember, on account of the anatomical arrangement of the vessels of the bladder, the more the bladder contracts the more blood is retained in its veins) and stops the hemorrhage, and the clots that have accumulated in the bladder, becoming softened by the urine, are expelled in the form of magmata. My own impression is that in these cases catheterization should be avoided as far as possible, for it is in the knowledge of all surgeons that the introduction of infectious material into

bloody foci very readily induces decomposition and sets up inflammation which may be far-reaching in its effects. Hence catheterization should be done under the most scrupulous antiseptic precautions and only when it becomes absolutely imperative to relieve the intense suffering of the patient. The question then arises, when the resort to the catheter is imperative, as to what to do with the clots. In some cases I have looked upon the presence of the clots as conservative; that is to say, the pressure of the clot, plus the contractile efforts of the bladder, has seemed to control the hemorrhage. But where the bladder is not comforted and quieted by the relief of the retention, and the clots are still present, it is evident that the bladder resents their presence, and of course the expulsive efforts of the bladder, by maintaining the congestion, add to the hemorrhage. The removal of the clots, then, in order to quiet the bladder, is in itself a hæmostatic procedure. I must withhold my approval of the injection of pepsine or peptonizing solutions of any kind into the bladder under such circumstances. Such materials easily decompose. They can scarcely be rendered so aseptic as not to run a very great risk of adding to the bloody contents of the bladder septic material. Hence I prefer to break up the clots either by the aid of some instrument, such as the lithotrite, or by careful and frequent ablution with an antiseptic solution to remove them gradually, or to reduce their volume to such an extent that the bladder itself can expel them. Should the hemorrhage continue and not be controlled by dilute astringent injections, one of the drainage operations, preferably by the perineum, may be undertaken.

The hyperæmia (congestion) of the bladder due to the presence of foreign bodies, including calculi, sometimes causes hæmaturia. It may be modified, and the hemorrhage stopped by rest in bed, careful ablution, and, if need be, the injection of dilute astringents (tannin, 2 to 100; zinc sulph., half grain to the ounce) not strong enough to irritate the bladder and cause its contraction, nor to form clots, until such time as in good judgment the foreign body can be removed.

In the case of neoplasms, whether benign or malignant, it seems to me that we can hardly wait—certainly not for any length of time—to counteract the symptom, for as a rule, when the cases present themselves to us, they are suffering largely from the effect of the loss of the blood, that is to say, acute anæmia. In my opinion, good judgment requires that we shall proceed to open the bladder by way of the supra public route and remove the neoplasm, if need be with a resection of a portion of the bladder, as speedily as possible.

As to the methods by which foreign bodies, such as calculi, should be removed, I have elsewhere given my opinion, and only refer to them now when they are causes of hæmaturia. When it has been definitely ascertained that the source of the

hemorrhage in the kidney, another series of questions is presented to us for solution.

In hæmaturia due to traumatism of the kidneys, such as result from falls or blows upon the renal regions, and where the associated symptoms are those of collapse and other evidence of excessive loss of blood in or about the kidney, I would advise unhesitatingly an incision, either lumbar or abdominal, which will give access to the great vessels of the kidney, and ligation of them. Records show the death-rate following traumatism and rupture of the kidney to be very high, and that it is usually due to the loss of blood, and not to the loss of function. It has been demonstrated that the kidney receives a supply of blood, moderate to be sure, from other vessels than the renal artery, sufficient at least to maintain the life of the kidney for a time long enough to enable the other kidney to accommodate itself to the increased demand upon it.

If the history points the presence of a retained calculus in the kidney, that is to say, recurring lumbar pain, preceded, accompanied or followed by the hæmaturia, and if the cystoscope locates the source of the hemorrhage, a judicious nephrotomy may be done and extraction of the calculus, if possible. It may be proper to say here that it has occurred to me, from failures of my own and from failures I have observed in the practice of colleagues to find stone in the kidney, that a wider incision through the kidney may be with safety and propriety made than I, at least, have been willing to make. Some investigations by F. Legueu¹ fortify me in this belief.

Hæmaturia due to neoplasms or tuberculosis of the kidney presents a question which I think must be determined by the individual cases. Roberts has shown, and with him accord the French observers, that with carcinoma of the kidney the duration of life is just about as long in the cases which have hæmaturia as in those which have not, and I am led to the conclusion that the hemorrhage alone is not a positive indication for a nephrectomy. The growth of the tumor, pain, the danger of infection to the rest of the body, and the possibility of the prolongation of life, provided always that the other kidney is normal, must lead the surgeon to decide whether nephrectomy should be performed or not. I think the same considerations apply to the individual in whom is developing a tubercular kidney. It is an interesting fact that the autopsy rooms show that not only have purulent foci in the kidney, but tubercular ones also, been surrounded by a protective capsule, and the individual passed a moderately comfortable and lengthy existence, somewhat handicapped, to be sure, by a more or less degenerated kidney.

31 EAST FORTY-FOURTH STREET.

¹ *Annales des Maladies des Organes Genito-Urinaire*, July, 1891.

